JPL Biotechnology and Planetary Protection Group

Protecting the Planets

An Overview of JPL's Planetary Protection Center of Excellence

Alvin L. Smith, Ph.D., PMP
Manager, Planetary Protection Center of Excellence
March 27, 2018

Jet Propulsion Laboratory
California Institute of Technology

This is NOT Planetary Protection.

(Parkes, WF., MacDonald, L. (Producers), & Sonnenfeld, B. (Director). (1997). Men In Black [Motion picture]. USA: Columbia Pictures.)

What is Planetary Protection?

- **Planetary Protection** addresses microbial contamination of the solar system:
  - Spacecraft that we launch from Earth (forward contamination)
  - Contamination of the Earth and Moon (backward contamination), from restricted sample return missions

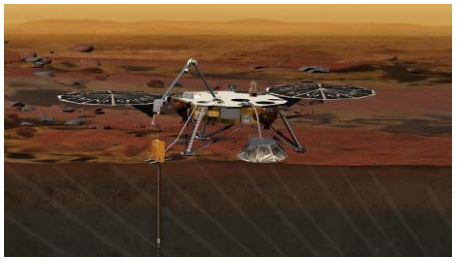
- To prevent either forward or backward contamination, spacecraft hardware must be cleaned and/or sterilized then evaluated for the presence of microorganisms.
  - Cleanroom environments
  - Cleaning the hardware
  - Routinely sample the cleaned hardware

(Thinkstock, 2018)

Biotechnology and Planetary Protection Group

- **Charter Statement**
  - The paramount goal of planetary protection is to enable and enhance NASA's ability to preserve the scientific integrity of current and future solar system exploration.
  - As JPL's Center of Excellence in this discipline, the JPL Biotechnology and Planetary Protection Group has the responsibility to:
    - Ensure mission compliance with internationally agreed planetary protection requirements through implementation of NASA policy
    - Provide advocacy and education to the scientific, project and programmatic communities regarding the role of planetary protection.
- **Goals**
  - To enable NASA Planetary Protection (PP) compliance for JPL missions
    - Life detection and/or Restricted Sample Return
    - Develop technology and capabilities and perform research to support spacecraft design and implementation
  - Play an integral role in planning for humans to explore Mars

Mars2020



InSight

Europa Clipper

Personnel and Capabilities

- 29 people in currently group - 40% bachelor, 20% masters, 40% PhD
- Many partnerships with cutting edge research labs and contracts

- **Expertise**
  - **Microbiology and Molecular Biology**
    - Cleanroom and spacecraft low biomass identification
    - Biological contamination control
    - Bioinformatics, space biology, microbial reduction and sterilization modalities, biomaterial storage
  - **Engineering**
    - Systems engineering – integral part in life detection instrument development, requirements flow, etc.
  - **Flight Implementation and Research**
  - **Biodetection Assays** (NASA Standard Assay, spore, Adenosine triphosphate, *Limulus amebocyte lysate*)
  - **Genetic Inventory**
  - **Spacecraft Microbial Archive**

PP Mission Support

Current Missions

- InSight
- Mars 2020
- Europa Clipper

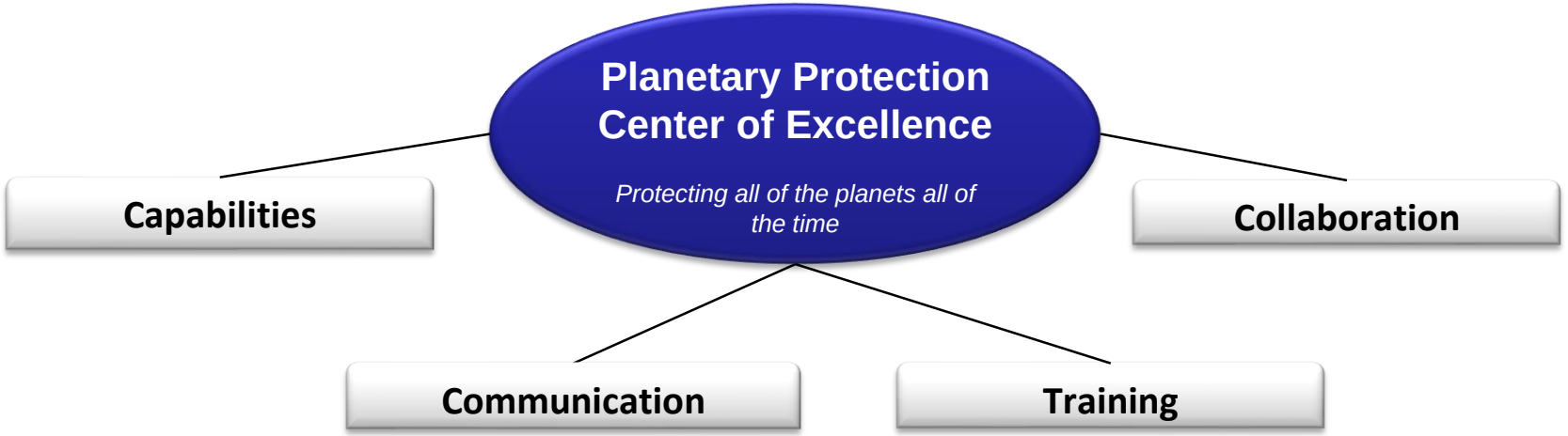
Future Mission Studies

- Europa Lander Concept
- Concepts for Mars Sample Return

Center of Excellence

Strategic Importance

- Helps promote and retain an institutionally recognized core capability
- Driver for staying at the “cutting-edge” of PP and technology development (biodetection, bioassay, and sampling)
- Provides framework for interdisciplinary, collaborative problem solving
- Promotes visibility of expertise that can help stimulate collaborations
- Recruit quality key personnel to build and train for the future
- Method for supporting/advocating for investment in maintaining required infrastructure/facilities



Capabilities

Flight Support Lab & Space Microbiology Lab

Sample Hardware (e.g. wipe)

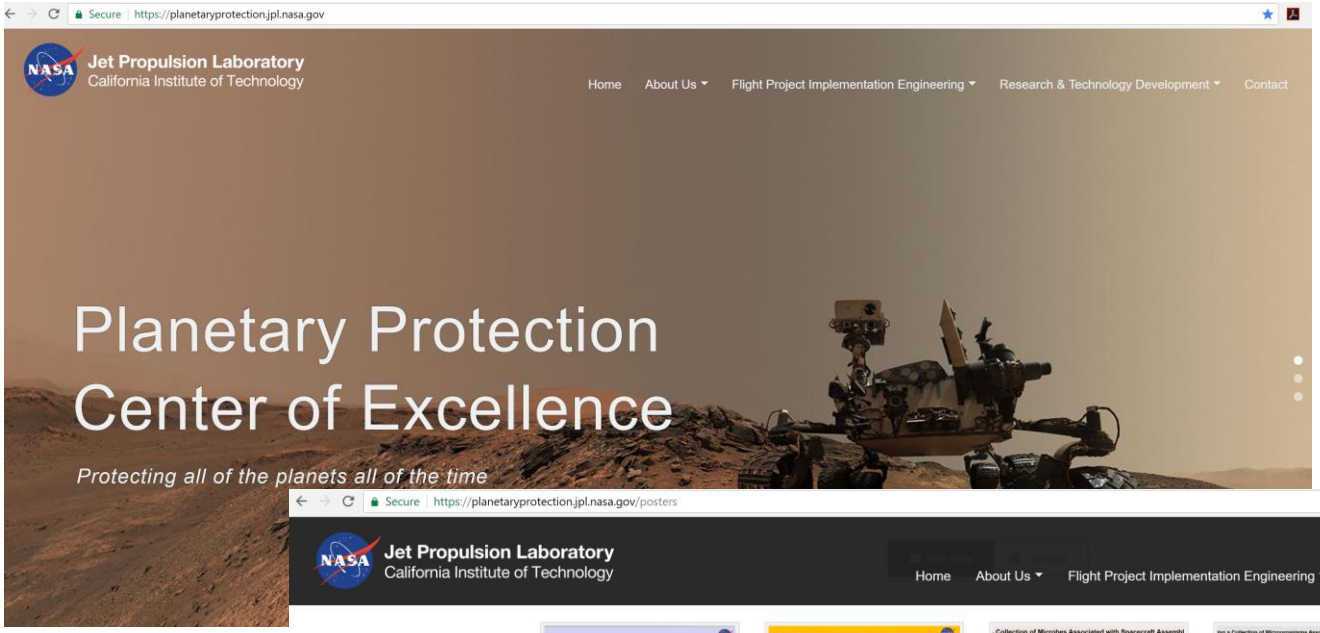
Sample Hardware (e.g. swab)

Microbial Archive

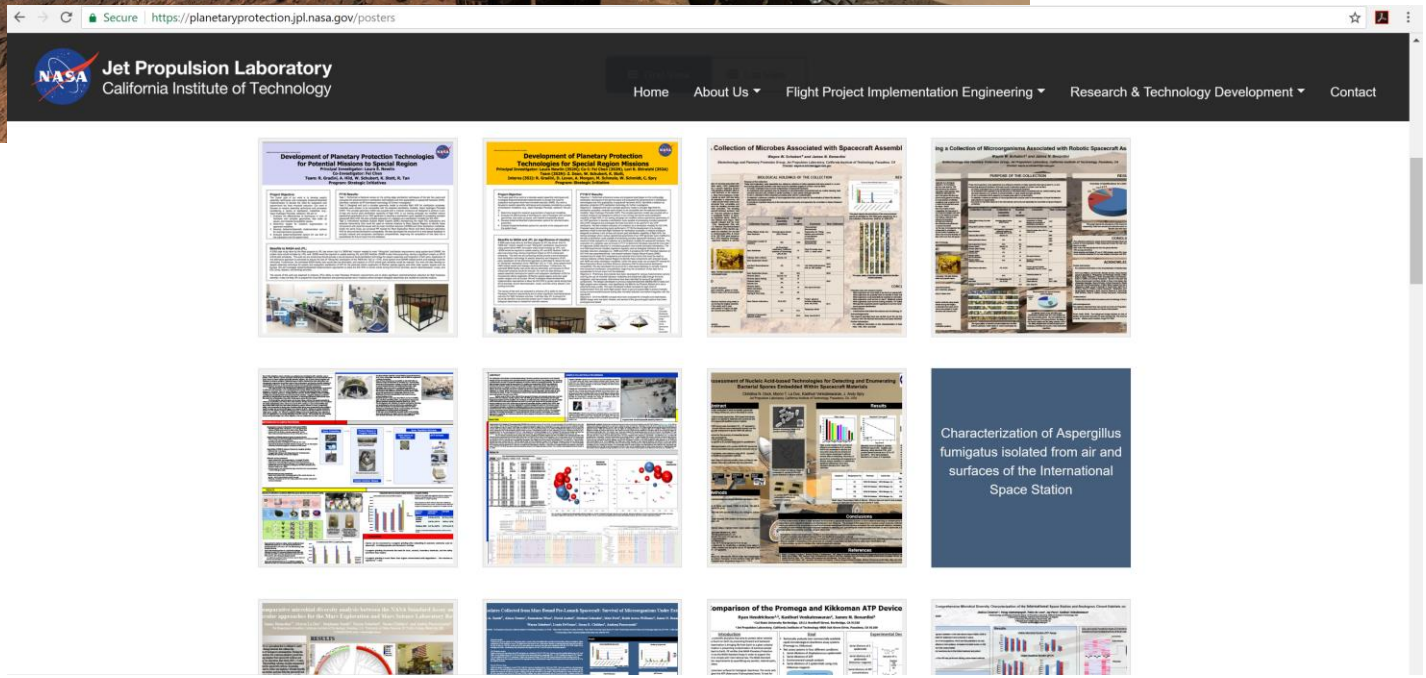
Microbiological Characterization

Counting Plates

Communication (https://planetaryprotection.jpl.nasa.gov)



Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government or the Jet Propulsion Laboratory, California Institute of Technology



Training

Current Staff Training/Refresh

Internships

Conferences and Workshops

AMERICAN SOCIETY FOR MICROBIOLOGY

AbGradCon 2018
ASTROBIOLOGY GRADUATE CONFERENCE
Atlanta, GA
June 4-8, 2018

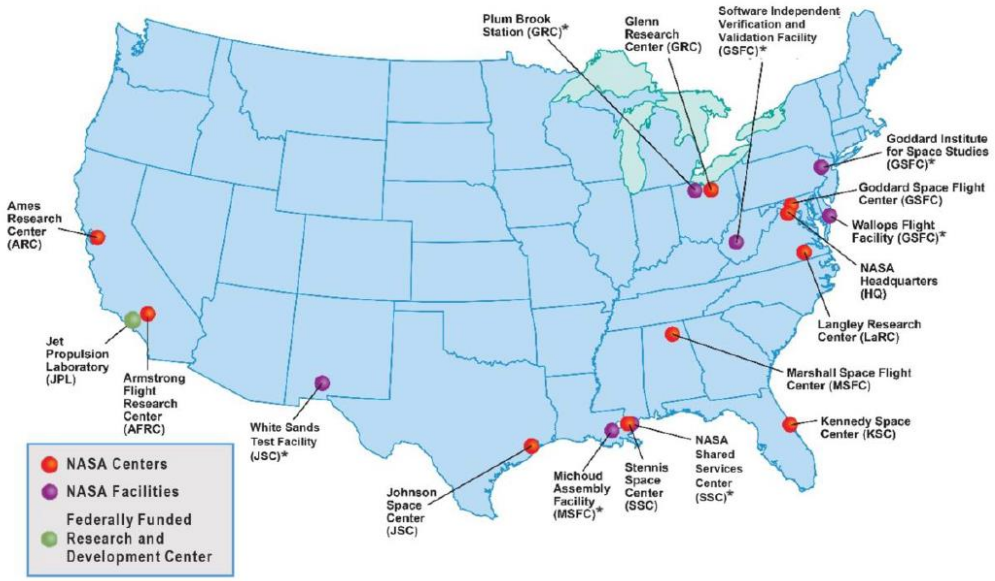
2018 INTERNATIONAL MARS SAMPLE RETURN CONFERENCE BERLIN

COSPAR 2018
42ND ASSEMBLY
60TH ANNIVERSARY

BIODETECTION TECHNOLOGIES:
Biothreat and Pathogen Detection

Collaborations

NASA Centers and Facilities



Industry

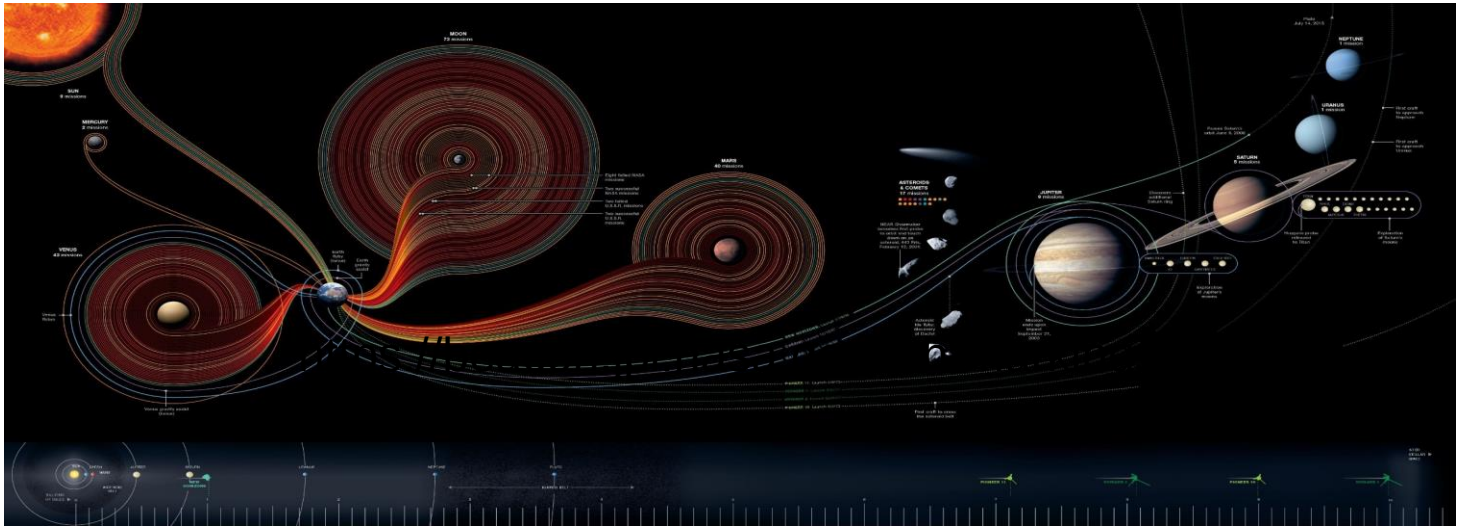
(Thinkstock, 2018)

Universities

Government Agencies

JPL Missions & Planetary Protection

Since 1958 NASA's Jet Propulsion Laboratory has taken part in more than **100 missions** and instruments designed to explore our Earth, solar system and beyond.



Planetary Protection will continue to be at the center of exploration protecting the planets and preserving science!

Planning for human exploration

Contact Information

PP Center of Excellence

Alvin Smith – Planetary Protection Center of Excellence Manager in Spacecraft Mechanical Engineering

Alvin.l.smith.ii@jpl.nasa.gov, o: 818-354-1756

Melissa Jones – Spacecraft Mechanical Engineering Assistant Section Manager

Melissa.A.Jones@jpl.nasa.gov , o: 818-393-3110

Jet Propulsion Laboratory
California Institute of Technology

jpl.nasa.gov